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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/471,659
Filing Date: December 24, 1999
Appellant(s): CLARK ET AL.

Pehr Jansson
For Appellant

MAILED
DEC 3 1 2007
GROUP 2800

EXAMINER'S ANSWER

This is in response to the appeal brief filed 10/3/2007 appealing from the Office action mailed 12/29/2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

The statement of the status of claims contained in the brief is correct.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,365,229	**Gardner**	**11-1994**
6,493,395	**Isaksson**	**12-2002**
6,473,438	**Cioffi**	**10-2002**
6,522,731	**Matsumoto**	**2-2003**
5,832,387	**Bae**	**11-1998**
5,812,599	**Van Kerckhove**	**9-1998**
6,647,058	**Bremer**	**11-2003**
6,469,636	**Baird**	**10-2002**

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 8, 13, 20, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardener et al in view of Isaksson et al., and in further view of Bremer et al.

Regarding claim 8, Gardener et al. discloses a telemetry system for transmitting well-logging data from at least one downhole tool (Fig. 1, block 12) to a surface data acquisition system (Fig. 1, block 29), the at least one downhole tool having a first tool data input/output interface (Fig. 1, block 16), the telemetry system comprising:

a down hole telemetry cartridge (Fig. 1, block 17) connected to at least one down hole tool (Fig. 1, block 12) via a modem (TX and RX) interface connected to the first tool data input/output interface (Fig. 1, block 16), wherein the downhole telemetry receives a bitstream for the at least one downhole tool over the modem input/ouput (TX/RX) interface (column 3, lines 1-9) and comprising:

an UL transmitter (Fig. 1, block 17 and Fig. 2, column 3, lines 10-15) connected to the second tool data input/output interface having a logic operable to cause the transmission of signals to an uphole telemetry unit connected to the downhole telemetry cartridge by a wireline, and

a cable driver (Fig. 2, cable driver) having transmission power level control circuitry having logic to control the transmission power to optimize the total transmission power applied to the wireline cable;

an uphole telemetry unit (Fig. 1, block 28) connected to the surface data acquisition system (Fig. 1, block 29) via an surface modem interface (Fig. 1, block 28 TX/RX interface) and comprising:

a receiver (Fig. 1, block 28 and Fig. 3, column 3, lines 16-23) connected to the surface data acquisition system having logic operable to receive the analog signals, to detect and decode (demodulate) the received signals into a bit stream and to output the bit stream to the acquisition computer via the TX/RX interface; and

a wireline cable (Fig. 1, block 11, column 3, lines 24-32) providing an electrical connection between the downhole telemetry cartridge and the uphole telemetry unit, wherein the analog signals are transmitted in an uphole direction on the wireline cable.

Gardener et al. does not disclose the apparatus having logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies and logic operable to receive the analog signals on the plurality of carrier frequencies and optimizing the total transmission power applied to the wireline in response to a received adjustment signal transmitted from the uphole telemetry unit wherein the adjustment signal is a function of cable length, cable material, cable temperature, and cable geometry; wherein the uphole telemetry units includes logic includes logic to repeatedly measure the received signal amplitude and to transmit the received adjustment signal in response to the measurement to the downhole telemetry cartridge.

However, Isaksson et al. discloses logic (Fig. 4, column 7, lines 5-19) operable to cause transmission (Fig. 4, Transmitter) of the bitstream as analog signals (multi-level pulses) on a plurality of carrier frequencies and logic (Fig. 4, Receiver) operable to receive the analog signals (multi-level pulses) on the plurality of carrier frequencies by the use of DMT modulation and logic to control. DMT modulation causes transmission of the bitstream as analog signals on a plurality of carrier frequencies. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the transmitter and receiver of Gardener et al. with the transmitter and receiver logic of Isaksson et al. since Isaksson et al. states DMT modulation handles frequency dependent loss and noise in cables in an efficient manner and also provides high bit rate traffic over the cables (column 1, lines 14-23 and column 7, lines 5-20).

Bremer et al. further discloses optimizing a transmission power applied to a cable (DSL) by measuring the SNR (column 5, lines 38-41) of a signal transmitted through the transmission cable and comparing this measured SNR of the transmitted signal to a minimum SNR (see

column 6, lines 1-15). The comparison is then used to generate a power control signal (see column 6, lines 1-15) as function of cable noise which can be caused by the length/geometry of the cable (see column 2, lines 35-38) and cable (copper) material (see column 1, lines 49-51), wherein the power control signal is transmitted to the transmitter used to adjust the signal power level of the transmitted signal before it is transmitted though the transmission cables (column 6, lines 1-15). The power control can be used in a DMT system absent any bits-per-carrier of power-level-per carrier adjustment (see column 10, lines 1-10). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify system of Gardener et al. and Isaksson et al. with the transmission power control as taught by Bremer et al. since Bremer et al. states the transmission power control can optimize the transmission cable length used in the system (see column 10, lines 18-20).

Regarding claim 13, the claim includes limitations corresponding to the above rejection of claim 8, which is applicable hereto.

Regarding claim 20, which inherits the limitations of claim 8, Gardener et al. further discloses the downhole telemetry cartridge is constructed from components capable of operation at temperatures above 150 degrees Celsius (column 3, lines 51-64).

Regarding claims 30, Gardener et al. further discloses using a wireline cable for transmission (column 3, lines 36-50), but Gardner et al, Isaksson et al. and Bremer et al. do not specifically disclose using a heptacable wireline cable. However, it would have been obvious to one skilled in the art at the time the invention that the use of a cable which provides resistance to temperature and pressure as taught by Gardener et al. (column 3, lines 35-60). Therefore, it

would be obvious to use a certain type of cable to provide resistance against the effects of well-logging.

2. Claims 2-7, 9, and 42-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardener et al. in view of Cioffi et al., and in further view of Baird et al.

Regarding claim 2, which inherits the limitations of claim 9, Gardener et al. further discloses the downhole telemetry cartridge (transmitter/receiver) is integrated into one of the at least one downhole tool (Fig. 2, column 2, lines 29-30).

Regarding claim 3, which inherits the limitations of claim 9, Gardener et al. further discloses the uphole receiver contains a clock recovery circuit to recover the clocking signal from the downhole unit operating at 360 KHz (column 6, lines 16-23 and column 7, lines 21-25), representing the downhole telemetry cartridge operating at a clock (sampling) frequency of 360 kHz, which is between 300 kHz and 500 kHz.

Regarding claim 4, which inherits the limitations of claim 9, Gardener et al. further discloses a cable driver (Fig. 2, cable driver) to drive the transmission signal to a desired frequency band (column 3, lines 10-16) and amplify the signal to convenient power level in a fashion similar to the line driver (column 3, lines 16-19) wherein these operations adjust total output power of the analog signal to a power level optimized (convenient) for the wireline cable.

Regarding claim 5, which inherits the limitations of claim 4, Gardener et al., Baird et al. and Cioffi et al. do not disclose the cable driver operating from a voltage supply range of at least –15 to 15 volts. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to supply a range of at least –15 to 15 volts to the driver to drive the transmission signal to a desired frequency band (Gardener et al, column 3, lines 10-16) and

amplify the signal to convenient power level in a fashion similar to the line driver (Gardener, et al., column 3, lines 16-19).

Regarding claim 6, which inherits the limitations of claim 4, Gardener et al., Baird et al. and Cioffi et al. do not specifically disclose the cable driver driving the total output power to the maximum input tolerance power level of the receiver. However, Baird et al. does disclose controlling power sources such as drivers to maximize the power capacity of a well-logging cable (column 11, lines 47-53). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to include this feature because maximizing power capacity of the cable and receiver would allow one the maximize data throughput.

Regarding claim 7, which inherits the limitations of claim 6, Gardener et al. further discloses the cable driver (Fig. 2, cable driver) operates to drive the total output power without consideration for cross-talk with other signals, wherein there is no mention that the cable driver of Gardener et al. taking into account cross-talk while driving the signal.

Regarding claim 9, Gardener et al. discloses a telemetry system for transmitting well-logging data from at least one downhole tool (Fig. 1, block 12) to a surface data acquisition system (Fig. 1, block 29), the at least one downhole tool having a first tool data input/output interface (Fig. 1, block 16), the telemetry system comprising:

a down hole telemetry cartridge (Fig. 1, blocks 17) connected to an uphole telemetry unit (Fig. 1, blocks 28-31) over a wireline cable (Fig. 1, element 11) that provides an electrical connection between the downhole telemetry cartridge and the uphole telemetry unit;

an down hole telemetry cartridge (Fig. 1, block 17 and Fig. 2, column 3, lines 10-15) connected to the at least one dowhole tool (Fig. 1, block 12) via a modem TX/RX interface

connected to the first tool data input/output interface (Fig. 1, block 16), wherein the downhole telemetry cartridge receives a bitstream from the at least one downhole tool over the modem input/ouput (TX/RX) interface (column 3, lines 1-9) and comprising:

an uplink (UL) transmitter (Fig. 1, block 17 and Fig. 2, column 3, lines 10-15) connected to the second tool data input/output interface having a logic operable to cause the transmission of signals to an uphole telemetry unit; and

an uphole telemetry unit (Fig. 1, block 28) connected to the surface data acquisition system (Fig. 1, block 29) via an surface modem interface (Fig. 1, block 28 TX/RX interface) and comprising:

a receiver (Fig. 1, block 28 and Fig. 3, column 3, lines 16-23) connected to the surface data acquisition system having logic operable to receive the analog signals, to detect and decode (demodulate) the received signals into a bit stream and to output the bit stream to the acquisition computer via the TX/RX interface; and

an uphole transmitter (Fig. 1, Surface Modem Transmitter (TX), column 3, lines 1-9) to transmit control signals from the surface computer (acquisition) system to the at least one down hole tool.

Gardener et al. does not disclose performing a training sequence periodically in the downhole transmitter having logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies, including transmitting a known signal on the plurality of carriers, to receive a control signal, and in response to a control signal, to adjust at least one characteristic selected from the set of total power, power-per-carrier and bits-per carrier, wherein the receiver in the uphole unit contains logic operable to receive the analog

signals on the plurality of carrier frequencies and the training sequence and adjust one of the set of characteristics based on the control signal. Gardener also does not disclose the control signals including a pilot signal are transmitted simultaneously on the wireline cable in a second propagation mode that is different from the first propagation mode.

However, Cioffi et al. discloses a remote unit (Fig. 1, block 22) having logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies (column 7, lines 57-61) using DMT modulation, including transmitting a training signal (column 16, lines 51-62) on the plurality of carriers (sub-channels), to receive a control signal to adjust a bits-per channel (see column 23, lines 11-18) wherein a receiver in a central unit (Fig. 1, block 10, column 7, lines 21-29) contains logic operable to receive the analog signals on the plurality of carrier frequencies and the training sequence (column 16, lines 51-62) and adjust a bits-per-carrier based on the training signal (column 16, line 62-column 17, line 10). Cioffi et al. further discloses the units are retrained periodically (column 17, lines 12-29 and column 25, lines 38-63) Cioffi et al. further discloses transmitting a pilot signal to obtain synchronization between the remote and central units (column 12, lines 1-7). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the system of Gardener et al. with DMT modulation and training as taught by Cioffi et al. since Cioffi et al. states DMT modulation avoids various signal distortion and noise problems (column 1, lines 21-25). It would have also been obvious to include the feature of the pilot signal to allow synchronization between a transmitter and receiver.

Baird et al. further discloses transmitting control signals such as pilot signals in a wireline well-logging telemetry system simultaneously on a wireline cable using different power

transmission modes (eigenmodes) representing different propagation modes (column 5, line 45-column 6, line 16). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Gardener et al. and Cioffi et al. with the teachings of Baird et al. and use different propagation modes over the cable in order to compensate for distortions over the cable (see Cioffi et al., column 5, lines 1-12).

Regarding claim 42, Cioffi et al. further discloses training the carriers is performed periodically (column 17, lines 11-32). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 43, Cioffi et al. further discloses retransmitting the training signal (retraining) in response to the line quality characteristics (column 25, lines 43-62).). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 44, Cioffi et al. further discloses retransmitting the training signal (retraining) in response to the line quality characteristics such as signal-to-noise ratio (column 25, lines 43-62). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

3. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gardener et al. in view of Cioffi et al., and in further view of Isaksson et al.

Regarding claim 12, Gardener et al. discloses a telemetry system for transmitting well-logging data from at least one downhole tool (Fig. 1, block 12) to a surface data acquisition system (Fig. 1, block 29), the at least one downhole tool having a first tool data input/output interface (Fig. 1, block 16), the telemetry system comprising:

a down hole telemetry cartridge (Fig. 1, block 17 and Fig. 2, column 3, lines 10-15) connected to the at least one dowhole tool (Fig. 1, block 12) via a modem TX/RX interface connected to the first tool data input/output interface (Fig. 1, block 16), wherein the downhole telemetry cartridge receives a bitstream from the at least one downhole tool over the modem input/ouput (TX/RX) interface (column 3, lines 1-9) and comprising:

an uplink (UL) transmitter (Fig. 1, block 17 and Fig. 2, column 3, lines 10-15) connected to the second tool data input/output interface having a logic operable to cause the transmission of signals to an uphole telemetry unit; and

a cable driver (see Gardener et al. ,Fig. 2, cable driver) to drive the transmission signal to a desired frequency band (column 3, lines 10-16) and amplify the signal to convenient power level (column 3, lines 16-19) and

an uphole telemetry unit (Fig. 1, block 28) connected to the surface data acquisition system (Fig. 1, block 29) via an surface modem interface (Fig. 1, block 28 TX/RX interface) and comprising:

a receiver (Fig. 1, block 28 and Fig. 3, column 3, lines 16-23) connected to the surface data acquisition system having logic operable to receive the analog signals, to detect and decode (demodulate) the received signals into a bit stream and to output the bit stream to the acquisition computer via the TX/RX interface; and

a wireline cable (Fig. 1, block 11, column 3, lines 24-32) providing an electrical connection between the downhole telemetry cartridge and the uphole telemetry unit, wherein analog signals are transmitted in an uphole direction on the wireline cable.

Gardener et al. does not disclose performing a training sequence periodically in the downhole transmitter having logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies, including transmitting a known signal on the plurality of carriers, to receive a control signal, and in response to a control signal, to adjust the power-per-carrier wherein the receiver in the uphole unit contains logic operable to receive the analog signals on the plurality of carrier frequencies and the training sequence and determine an adjustment to the power-per-carrier. Gardener also does not disclose the cable driver independently controls the transmission power of each carrier frequency using control signals from the uphole unit. However, Cioffi et al. discloses a remote unit (Fig. 1, block 22) having logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies (column 7, lines 57-61) using DMT modulation, including transmitting a training signal (column 16, lines 51-62) on the plurality of carriers (sub-channels), to receive a control signal to adjust a bits-per channel (see column 23, lines 11-18) wherein a receiver in a central unit (Fig. 1, block 10, column 7, lines 21-29) contains logic operable to receive the analog signals on the plurality of carrier frequencies and the training sequence (column 16, lines 51-62) and adjust a bits-per-carrier based on the training signal (column 16, line 62-column 17, line 10). Cioffi et al. further discloses the units are retrained periodically (column 17, lines 12-29 and column 25, lines 38-63) Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the system of Gardener et al. with DMT modulation and

training as taught by Cioffi et al. since Cioffi et al. states DMT modulation avoids various signal distortion and noise problems (column 1, lines 21-25).

Isaksson et al. further discloses using a training period similar to Cioffi et al. which is used to measure an SNR to determine a transmission power (power-per-carrier) for each individual carrier frequency (column 7, lines 5-20 and column 19, lines 36-47). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the system of Gardener et al. and Cioffi et al. to incorporate adjusting the transmission power (power-per-carrier) of each carrier frequency during training as taught by Isaksson et al. in order to adjust the power of each carrier using a control signal based on a training signal (as disclosed by Cioffi et al. above) since Isaksson et al. states this approach handles frequency dependent loss and noise in the cables (column 7, lines 5-20).

4. Claims 14, 16, 17, 21-25, 28, 29, 31-35, 37-41, 48 and 51-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardener et al. in view of Matsumoto, and in further view of Cioffi et al.

Regarding claim 14, Gardener et al. discloses a telemetry system for transmitting well-logging data from at least one downhole tool (Fig. 1, block 12) to a surface data acquisition system (Fig. 1, block 29), the at least one downhole tool having a first tool data input/output interface (Fig. 1, block 16), the telemetry system comprising:

a downhole telemetry cartridge (Fig. 1, block 17 and Fig. 2, column 3, lines 10-15) connected to the at least one dowhole tool (Fig. 1, block 12) via a modem TX/RX interface connected to the first tool data input/output interface (Fig. 1, block 16), wherein the downhole

telemetry cartridge receives a bitstream from the at least one downhole tool over the modem input/ouput (TX/RX) interface (column 3, lines 1-9) and comprising:

an uplink (UL) transmitter (Fig. 1, block 17 and Fig. 2, column 3, lines 10-15) connected to the second tool data input/output interface having a logic operable to cause the transmission of signals to an uphole telemetry unit; and

an uphole telemetry unit (Fig. 1, block 28) connected to the surface data acquisition system (Fig. 1, block 29) via an surface modem interface (Fig. 1, block 28 TX/RX interface) and comprising:

a receiver (Fig. 1, block 28 and Fig. 3, column 3, lines 16-23) connected to the surface data acquisition system having logic operable to receive the analog signals, to detect and decode (demodulate) the received signals into a bit stream and to output the bit stream to the acquisition computer via the TX/RX interface; and

a wireline cable (Fig. 1, block 11, column 3, lines 24-32) providing an electrical connection between the downhole telemetry cartridge and the uphole telemetry unit, wherein analog signals are transmitted in an uphole direction on the wireline cable.

Gardener et al. does not disclose the apparatus having logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies and logic operable to receive the analog signals on the plurality of carrier frequencies wherein the logic includes:

a tone ordering logic operable to divide the bit stream into bit groups such that there is a one-to-one mapping between bit groups and carrier frequencies;

a bits-per-carrier table containing a mapping between each bit group and the number of bits allocated to each carrier for one cycle of operation; and

a constellation encoder connected to receive the bit groups from the tone ordering logic and the bits-per-carrier from the bits-per-carrier table, and operable to encode the bit groups as complex numbers.

Gardener et al. further does not disclose a training logic executed repeatedly during the course of a logging job and operable to produce the bits-per-carrier table.

Matsumoto discloses an apparatus (Fig. 2 and Fig. 4) which can be enclosed in a transmitter/receiver (modem) having logic operable to cause transmission of the bitstream as analog signals on a plurality of carrier frequencies and logic operable to receive the analog signals on the plurality of carrier frequencies by use of DMT modulation (column 1, lines 15-25), wherein the logic includes:

a tone ordering logic (Fig. 4, block 88, column 10, lines 14-42) operable to divide the bit stream into bit groups by assigning the signal (bits) to each carrier for each frequency band such that there is a one-to-one mapping between bit groups and carrier frequencies;

a bits-per-carrier table (Figs. 2 and 4, blocks 79 and 80, column 1, lines 38-47, column 5, lines 49-57 and column 12, lines 16-32) containing a mapping between each bit group and the number of bits allocated to each carrier for one cycle of operation; and

a constellation encoder (Fig. 4, block 89, column 7, lines 31-52 and column 12, lines 16-32) connected to receive the bit groups from the tone ordering logic and the bits-per-carrier from the bits-per-carrier table, and operable to encode the bit groups as a constellation (complex numbers).

DMT modulation causes transmission of the bitstream as analog signals on a plurality of carrier frequencies. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the transmitter and receiver of Gardener et al. with the transmitter and receiver logic of Matsumoto since Matsumoto states DMT modulation can provide high speed digital communication (column 1, lines 15-25).

Cioffi et al. further discloses executing a training logic (retraining) repeatedly during the course of a communication session which is operable to update a bits-per-carrier matrix (column 17, lines 11-45). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the system of Gardener et al. and Matsumoto with the periodic training signal as taught by Cioffi et al. to allow the dynamic adjustment of communication parameters based on line quality parameters (Cioffi et al. column 25, lines 57-63).

Regarding claim 16, Cioffi et al. further discloses the training logic comprises a first logic in a first device (Fig. 1, block 22) and a second logic in a second device (Fig. 1, block 10), wherein the first logic comprises:

logic (column 16, lines 51-54) operable to transmit a training signal on each of a plurality of carriers; and

logic (column 23, lines 11-19) operable to receive the number of bits-per-carrier from the second device;

the second logic comprising:

logic (column 25, lines 41-47) operable to measure the signal-to-noise ratio of the training signal;

logic (column 25, lines 48-56) operable to determine the number of bits-per-carrier (amount of data to be transmitted on each channel) as a function of the signal-to-noise ratio (wherein the SNR is a line quality parameter); and

logic (column 23, lines 11-19) operable to cause transmission of the number of bits-per-carrier to the first device.

It would have been obvious to include the training logic to allow the dynamic adjustment of communication parameters based on line quality parameters (Cioffi et al. column 25, lines 57-63).

Regarding claim 17, Cioffi et al. further discloses the first device (Fig. 1, block 22) comprises logic to populate a bits-per-carrier table (column 23, lines 11-19) based on instructions from the second device (Fig. 1, block 10); and

the second device determines a bits-per-carrier table (column 17, lines 2-10) with the same number of bits-per-carrier sent by instructions to the first device (column 23, lines 11-19). It would have been obvious to include the training logic to allow the dynamic adjustment of communication parameters based on line quality parameters (Cioffi et al. column 25, lines 57-63).

Regarding claim 21, Gardener et al. discloses a method of operating a well-logging telemetry system having a downhole telemetry cartridge (Fig. 1, blocks 12 and 14-17) and an uphole telemetry unit (Fig. 1, blocks 28-31) connected by a wireline cable (Fig. 1, block 11). Gardener does not disclose executing a training sequence having the steps of:

transmitting a known signal on each of a plurality of carriers from the downhole telemetry cartridge to the uphole telemetry unit;

measuring at the second telemetry unit the signal-to-noise ratio on the known signal on each of the plurality of carriers;

using the signal-to-noise ratio measurement to determine the number of bits-per constellation to use for each carrier; and

populating a bits-per-carrier table with the bits-per-constellation value for each carrier; and

dynamically adjusting the bit-per-carrier table during the course of a logging job by re-transmitting the known signal on a subset of the plurality of carriers, re-measuring at the uphole telemetry unit the signal-to-noise ratio on each of the subset of the plurality of carriers, using the re-measured signal-to-noise ratio on each of the subset of the plurality of carrier to determine the number of bits-per-constellation to use for each subset of the plurality of carriers; and populating the bits-per-carrier table entries for each subset of the plurality of carriers with the bits-per-constellation value for each of the subset of the plurality of carriers.

However, Matsumoto discloses a method of operating a system having a first telemetry cartridge (Fig. 1A) and a second telemetry cartridge (Fig. 1B) connected by a wireline cable (telephone line) comprising executing a training logic having the steps of:

transmitting (column 1, lines 38-47) a known signal (received wave for each channel) on each of a plurality of carriers from the first telemetry cartridge to the second telemetry unit;

measuring (column 1, lines 38-47) at the second telemetry unit the signal-to-noise ratio on the known signal on each of the plurality of carriers;

using (column 1, lines 38-47) the signal-to-noise ratio measurement to determine the number of bits-per constellation to use for each carrier; and

populating (column 1, lines 38-47 and column 5, lines 49-57) a bits-per-carrier table with the bits-per-constellation value for each carrier.

This training is performed for DMT modulation (column 1, lines 38-39). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Gardener et al. with the DMT modulation and training method of Matsumoto since Matsumoto states DMT modulation can provide high speed digital communication (column 1, lines 15-25).

Cioffi et al. further discloses dynamically updating (column 17, lines 26-45) the bit-per-carrier table for DMT modulation during the course of a communication session by re-transmitting a training signal (re-training) on a subset of the plurality of carriers, re-measuring the signal-to-noise ratio of the training signal (column 25, lines 41-47), using the re-measured signal-to-noise ratio to determine the amount of data (column 25, lines 46-52) transmitted on each channel (bits-per-carrier) to use for each subset of the plurality of carriers (column 17, lines 39-45); and populating a bits-per-carrier matrix entries for each subset of the plurality of carriers with the bits-per-carrier (column 17, lines 39-52) value for each of the subset of the plurality of carriers. Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the method of Gardener et al. and Matsumoto with the retraining as taught by Cioffi et al. to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 22, which inherits the limitations of claim 21, Matsumoto further disclose populating a bits-per-carrier table the first and second telemetry cartridges (column 5, lines 21-32 and lines 49-57). It would have been obvious to include this feature since

Matsumoto states DMT modulation can provide high speed digital communication (column 1, lines 15-25).

Regarding claim 23, Gardener et al. disclose acquiring well-logging data from a well-logging tool (column 2, line 66-column 3, line 9). However, Gardener et al., Matsumoto, and Cioffi et al. do not disclose one of the steps of the training sequence is executed concurrently with the step of acquiring well-log data. However, it would have been obvious to one skilled in the art to include this feature since Cioffi et al. discloses training allows dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claims 24 and 25, Matsumoto discloses both frequency and time domain equalization (column 5, lines 32-47), but Gardener et al., Matsumoto and Cioffi et al. do not specifically disclose transmitting a known complex number from the dowhole unit to the second uphole unit; receiving a transmitted complex number at the uphole unit; and dividing the receive complex number by the known complex number to obtain an adjustment parameter for equalization.

However, Gardener et al. does disclose an adaptive equalization method (Fig. 9, column 5, lines 20-34) which includes transmitting a known signal y(T), receiving and estimating the known signal, comparing the receive and processed signal d(T-L) with the equalized transmitted known signal d(T-L) to obtain an estimation error (column 7, lines 41-47), and using the estimation error for equalization (column 7, lines 49-67). Therefore, it would have been obvious to include this feature or similar method for adjusting equalization parameters since Gardener et

al. states adaptive equalization can continuously correct for cable distortion (column 8, lines 31-34).

Regarding claim 28, Gardener et al. discloses a method of operating a well-logging telemetry system having a downhole telemetry cartridge (Fig. 1, blocks 12 and 14-17) and an uphole telemetry unit (Fig. 1, blocks 28-31) connected by a wireline cable (Fig. 1, block 11). Gardener does not disclose the method includes the steps of:

modulating a bit stream onto a plurality of carrier frequencies;

transmitting the modulated bit stream on a first propagation mode from the downhole device to the uphole device;

operating the uphole device to demodulate the received bitstream;

during the course of a logging job, repeatedly;

using a training sequence to populate a bits-per-carrier table in the dowhole device and a bits-per-carrier table in the uphole device;

wherein the step of modulating the bit stream onto a plurality of carrier frequencies modulates the bit stream for each carrier according to values stored in the downhole bits-per-carrier table for such each carrier; and

wherein the step of demodulating the bit stream demodulates the bit stream from each carrier according to values stored in the uphole bits-per-carrier table

However, Matsumoto discloses a method of operating a system having a device (Fig. 3, 6a) and a second device (Fig. 3, 6b) connected by a wireline cable (telephone line) comprising:

modulating (Fig. 4, column 9, line 26-column 10, line 23) a bit stream onto a plurality of carrier frequencies;

transmitting (Fig. 4, column 9, line 26-column 10, line 23) the modulated bit stream on a first propagation mode from the first device to the second device;

operating (Fig. 4, column 6, line 43-column 7, line 63) the second device to demodulate the received bitstream;

using (column 1, lines 38-47, column 5, lines 49-56, and column 12, lines 17-32) a training sequence to populate a bits-per-carrier table in the first device and a bits-per-carrier table in the second device;

wherein (column 1, lines 38-47, column 5, lines 49-56, and column 14, lines 17-32) the step of modulating the bit stream onto a plurality of carrier frequencies modulates the bit stream for each carrier according to values stored in the first device for such each carrier; and

wherein the step of demodulating the bit stream demodulates the bit stream from each carrier according to values stored in the second device (column 1, lines 38-47, column 5, lines 49-56, and column 14, lines 17-32).

The modulation and training is performed using DMT modulation (column 1, lines 38-39). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Gardener et al. with the DMT modulation and training method of Matsumoto since Matsumoto states DMT modulation can provide high speed digital communication (column 1, lines 15-25).

Cioffi et al. further discloses executing a training sequence (retraining) repeatedly during the course of a communication session which is operable adjust characteristics of a carrier matrix (column 17, lines 11-45). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the method of Gardener et al. and Matsumoto with the

repetition of training signal as taught by Cioffi et al. to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 29, Gardener et al. discloses a method of operating a well-logging telemetry system having a downhole telemetry cartridge (Fig. 1, blocks 12 and 14-17) and an uphole telemetry unit (Fig. 1, blocks 28-31) connected by a wireline cable (Fig. 1, block 11). Gardener does not disclose the method includes the steps of:

modulating a bit stream onto a plurality of carrier frequencies;

transmitting the modulated bit stream on a first propagation mode from the downhole device to the uphole device;

operating the uphole device to demodulate the received bitstream;

during the course of a logging job, repeatedly;

using a training sequence to populate a gain table in the first device and a gain table in the uphole device; and

adjusting the gain on each carrier based on values stored in the gain table of the downhole device.

However, Matsumoto discloses a method of operating a system having a device (Fig. 3, 6a) and a second device (Fig. 3, 6b) connected by a wireline cable (telephone line) comprising:

modulating (Fig. 4, column 9, line 26-column 10, line 23) a bit stream onto a plurality of carrier frequencies;

transmitting (Fig. 4, column 9, line 26-column 10, line 23) the modulated bit stream on a first propagation mode from the first device to the second device;

operating (Fig. 4, column 6, line 43-column 7, line 63) the second device to demodulate the received bitstream;

using (column 1, lines 38-47, column 5, lines 49-56, and column 12, lines 17-32) a training sequence to populate a gain table in the first device and a gain table in the second device; and

adjusting the gain on each carrier based on values stored in the gain table of a first device (column 1, lines 38-47, column 5, lines 49-56, and column 12, lines 17-32).

The modulation and training is performed using DMT modulation (column 1, lines 38-39). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the method of Gardener et al. with the DMT modulation and training method of Matsumoto since Matsumoto states DMT modulation can provide high speed digital communication (column 1, lines 15-25).

Cioffi et al. further discloses executing a training sequence (retraining) repeatedly during the course of a communication session which is operable adjust characteristics of the carriers (column 17, lines 11-45). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the method of Gardener et al. and Matsumoto with the repetition of training signal as taught by Cioffi et al. to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claims 31 and 32, Gardener et al. further discloses using a wireline cable for transmission (column 3, lines 36-50), but Gardner et al, Matsumoto, and Cioffi et al. do not specifically disclose using a heptacable wireline cable. However, it would have been obvious to

one skilled in the art at the time the invention that the use of a cable which provides resistance to temperature and pressure as taught by Gardener et al. (column 3, lines 35-60). Therefore, it would be obvious to use a certain type of cable to provide resistance against the effects of well-logging.

Regarding claim 33, Gardener et al. further discloses the downhole telemetry cartridge (transmitter/receiver) is integrated into one of the at least one downhole tool (Fig. 2, column 2, lines 29-30).

Regarding claims 34, Gardener et al. further discloses using a wireline cable for transmission (column 3, lines 36-50), but Gardner et al, Matsumoto, and Cioffi et al. do not specifically disclose using a heptacable wireline cable. However, it would have been obvious to one skilled in the art at the time the invention that the use of a cable which provides resistance to temperature and pressure as taught by Gardener et al. (column 3, lines 35-60). Therefore, it would be obvious to use a certain type of cable to provide resistance against the effects of well-logging.

Regarding claim 35, Gardener et al. further discloses the downhole telemetry cartridge is constructed from components capable of operation at temperatures above 150 degrees Celsius (column 3, lines 51-64).

Regarding claim 37, Cioffi et al. futher discloses retraining the carriers is performed periodically (column 17, lines 11-32). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 38, Cioffi et al. further discloses retransmitting the training signal (retraining) in response to the line quality characteristics (column 25, lines 43-62).). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 39, Cioffi et al. further discloses retransmitting the training signal (retraining) in response to the line quality characteristics such as signal-to-noise ratio (column 25, lines 43-62). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 40, Cioffi et al. discloses transmitting the retraining signal to detect line quality parameters in response to the changes in line quality during use (column 25, lines 46-63).

Regarding claim 41, Cioffi et al. discloses transmitting the retraining signal to detect line quality parameters in response to the changes in line quality such as signal-to-noise ratio during use (column 25, lines 46-63).

Regarding claim 48, Cioffi et al. futher discloses retraining to populate a bits-per-carrier matrix is performed periodically (column 17, lines 11-32). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 51, Cioffi et al. futher discloses retraining to populate a bits-per-carrier matrix is performed periodically (column 17, lines 11-32). It would have been obvious to

include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 52, Cioffi et al. futher discloses retraining to populate a bits-per-carrier matrix is performed periodically (column 17, lines 11-32) in response to line quality characteristics (column 25, lines 43-62). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 53, Cioffi et al. further discloses retraining to populate a bits-per-carrier matrix is performed periodically (column 17, lines 11-32) in response to line quality characteristics including signal-to-noise ratio (column 25, lines 43-62). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

5. Claims 26, 45-47, 49, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardener et al. in view of Bae, and in further view of Cioffi et al.

Regarding claim 26, Gardener et al. discloses a method of operating a well-logging telemetry system having a downhole telemetry cartridge (Fig. 1, blocks 12 and 14-17) and an uphole telemetry unit (Fig. 1, blocks 28-31) connected by a wireline cable (Fig. 1, block 11). Gardener does not disclose repeatedly executing a training sequence having the steps of:

transmitting a signal of known power level on each of a plurality of carriers from the dowhole device to the uphole device;

measuring the signal amplitude received on each carrier;

comparing the power level received on each carrier to a predetermined maximum power level for each carrier

based on the comparison of the power level, transmitting an indication to adjust the power level on at least one of the carriers from the uphole device to the downhole device; and

adjusting the power level of at least one of the carriers based on the indication received.

However, Bae et al. discloses a method of operating a system having a device (Fig. 1 and Fig. 8) and a second device (Fig. 2 and Fig. 8) connected by a wireline cable which performs a training sequence including the steps of:

transmitting (column 4, lines 26-35) a signal of known power level on each of a plurality of carriers from the first device to the second device;

measuring (Fig. 5, step 400, column 4, line 36-column 5, line 25) the signal amplitude received on each carrier;

comparing (Fig. 5, steps 404, 406, and 408, column 4, line 36-column 5, line 25) the power level received on each carrier to a predetermined maximum power level for each carrier

based (Fig. 5, step 410, column 4, line 36-column 5, line 25) on the comparison of the power level, transmitting an indication to adjust the power level on at least one of the carriers from the second device to the first device; and

adjusting (Fig. 5, step 410, column 4, line 36-column 5, line 25) the power level of at least one of the carriers based on the indication received.

The training sequence is performed for multicarrier modulation (column 1, lines 5-14). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the well-logging method with the multicarrier modulation and training as

taught by Bae et al. since Bae states multicarrier modulation is the optimum modulation method in which data approximating channel capacity can be transmitted with a minimal error probability (column 1, lines 15-20).

Cioffi et al. further discloses executing a training sequence (retraining) repeatedly during the course of a communication session which is operable adjust characteristics of a carrier(column 17, lines 11-45). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to modify the system of Gardener et al. and Bae et al. with the repetition of training signal as taught by Cioffi et al. to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 45, Cioffi et al. further discloses retraining is performed periodically (column 17, lines 11-32). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 46, Cioffi et al. further discloses retransmitting the training signal (retraining) in response to the line quality characteristics (column 25, lines 43-62). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 47, Cioffi et al. further discloses retransmitting the training signal (retraining) in response to the line quality characteristics such as signal-to-noise ratio (column 25, lines 43-62). It would have been obvious to include this feature to allow the dynamic

adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 49, Cioffi et al. further discloses retraining to populate a bits-per-carrier matrix is performed periodically (column 17, lines 11-32) in response to line quality characteristics (column 25, lines 43-62). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

Regarding claim 50, Cioffi et al. further discloses retraining to populate a bits-per-carrier matrix is performed periodically (column 17, lines 11-32) in response to line quality characteristics including signal-to-noise ratio (column 25, lines 43-62). It would have been obvious to include this feature to allow the dynamic adjustment of communication parameters based on line quality parameters which vary over time (Cioffi et al. column 25, lines 57-63).

6. Claim 36 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gardener et al. in view of Bae et al., and in further view of Cioffi et al. as applied to claim 26, and further in view of Van Kerchove (previously cited in Office Action 9/12/2005).

Regarding claim 36, Gardener et al., Bae et al., and Cioffi et al. disclose all the limitations of claim 36 (see rejection above) except determining whether an increase in power level would improve the bits-per-carrier for the each carrier and whether a decrease in power level would degrade the bits-per-carrier for the each carrier; and

wherein in the transmitting step, based on both the comparison of power level and determination of improvement or degradation in bits-per-carrier for at least one of the carriers, the indication to adjust the power level on the at least one of the carriers indicates to increase the

power level if an improvement in number of bits-per-carrier may be achieved by a permissible increase in power and wherein the indication to adjust the power level on the at least one of the carriers indicates to lower the power level if there would be no degradation in the number of bits-per-carrier by lowering the power level.

Van Kerchove discloses determining whether an increase in power level would improve the bits-per-carrier for the each carrier (column 11, line 20-column 12, line 23) and whether a decrease in power level would degrade the bits-per-carrier for the each carrier (column 12, line 36-column 13, line 39, wherein the decision is based on a calculated noise margin); and

wherein in the transmitting step, based on both the comparison of power level and determination of improvement or degradation in bits-per-carrier for at least one of the carriers, the indication to adjust the power level on the at least one of the carriers indicates to increase the power level if an improvement in number of bits-per-carrier may be achieved by a permissible increase in power (column 4, lines 26-42 and column 11, line 20-column 12, line 23, wherein the improvement is increased data elements) and wherein the indication to adjust the power level on the at least one of the carriers indicates to lower the power level if there would be no degradation in the number of bits-per-carrier by lowering the power level (column 5, lines 14-25 and column 12, line 36-column 13, line 39, wherein the degradation is decreased noise margin).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the multicarrier transmission method of Gardener et al., Bae et al., and Cioffi et al. with the teachings of Van Kerchove since Van Kerchove states that his method allows the global capacity of the carriers to be enlarged and maximizes the minimum additional

noise margins amongst the carriers which renders data transmission less sensitive for noise (column 5, lines 4-25).

(10) Response to Argument

MPEP 2141 [R-6] states "**The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in KSR noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. The Court quoting In re Kahn, 441 F.3d 977, 988, 78 USPQ2d 1329, 1336 (Fed. Cir. 2006), stated that "[R]ejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.'" KSR, 550 U.S. at __, 82 USPQ2d at 1396. Exemplary rationales that may support a conclusion of obviousness include:**

(A) Combining prior art elements according to known methods to yield predictable results;

(B) Simple substitution of one known element for another to obtain predictable results;

(C) Use of known technique to improve similar devices (methods, or products) in the same way;

(D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;

(E) " Obvious to try " – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;

(F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;

(G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention."

With the guidance of *KSR*, the Examiner has used the rationale that a known technique is being applied to a known device to support the legal conclusion of obviousness with regards to the obviousness rejection of the claims under appeal. In this instance, the known technique is multicarrier modulation, wherein the known device is a well-logging telemetry device. The present invention as claimed simply takes a well known form of multicarrier modulation (DMT) and simply uses the modulation in a known transmission/reception system in a well-logging environment which uses cables as a propagation medium between the transmitter and receiver. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made that since it is well known that DMT modulation can be used in the presence of cables as shown by the cited references Matsumoto and Bae, that the claimed invention simply applies the known technique of multicarrier modulation to a known well-logging communication device to provide predictable results such as the transmission and reception of data using a plurality of carriers/frequencies in the well-logging communication system.

Combination of Gardner and Isaksson

The Appellant states (see page 31 of the Appeal Brief) "**Given the various inherent difficulties of operating communications equipment in a borehole and the highly dynamic nature of the communications channel in a well-logging wireline application, and the limitations described in *Isaksson,* it cannot be said that applying *Isaksson* to *Gardner* would yield a predictable result. Furthermore, the making such a system work would require much more than just plugging *Isaksson* into *Gardner* in the manner that the innovation in *KSR* was merely the placement of a sensor at a location taught by a second reference.**"

Again, with the guidance of *KSR*, the Examiner has used the rationale that a known technique is being applied to a known device to support the legal conclusion of obviousness with regards to the obviousness rejection of the claims under appeal. Gardener discloses a known well-logging telemetry system which uses cables as a propagation medium (see column 1, lines 13-27). Isaksson further discloses a known multicarrier transmission system over copper wire cables (see column 1, lines 14-31). It is the understanding of the Examiner that applying the known multicarrier properties of Isaksson to the cable telemetry system of Gardener would yield predictable results, such as the known principle of multicarrier transmission over cables. Therefore, the present invention as claimed simply takes a well known form of multicarrier modulation (DMT) and simply uses the modulation in a known transmission/reception system in a well-logging environment which uses cables as a propagation medium between the transmitter and receiver. This application yields predictable results.

The Appellant further states (see pages 32-33 of the Appeal Brief) "The motivation, suggestion or teaching [of the proposed combination] may come explicitly form statements in the prior art, the knowledge of one of ordinary skill in the art, or in some cases the

nature to be solved." ***In re Kotzab,*** **at 1370. In the present case there is no teaching or suggestion in either** ***Gardner*** **nor in** ***Isaksson*** **to combine the teachings of the one with the other. The Examiner has argued that the motivation to combine is that "since** ***Isaksson*** **et al. states DMT modulation handles frequency dependent loss and noise in cables in an efficient manner and also provides high bit rate traffic over the cables (column 1, lines 14-23 and column 7, lines 5-20)" (Office Action, Page 4, Lines 17-19).**

The guidance of ***KSR,*** **that with respect to inventions that "involve more that the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement", has not been met by the Examiner.** ***KSR*** **states that in such cases "it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an "The motivation, suggestion or teaching [of the proposed combination] may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or in some cases the nature to be solved."** ***In re Kotzab,*** **at 1370. In the present case there is no teaching or suggestion in either** ***Gardner*** **nor in** ***Isaksson*** **to combine the teachings of the one with the other. The Examiner has argued that the motivation to combine is that "since** ***Isaksson*** **et al. states DMT modulation handles frequency dependent loss and noise in cables in an efficient manner and also provides high bit rate traffic over the cables (column 1, lines 14-23 and column 7, lines 5-20)" (Office Action, Page 4, Lines 17-19).**

The guidance of *KSR,* that with respect to inventions that "involve more that the simple substitution of one known element for another or the mere application of a known technique to a piece of prior art ready for the improvement", has not been met by the Examiner. *KSR* states that in such cases "it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis should be made explicit." *KSR* at 1740. It is implicit that the reasoning also should make good logical sense.

That is not the case here. The motivation that *Isaksson* states that DMT modulation handles frequency dependent loss and noise in cable in an efficient manner and also provides high bit rate traffic over cables is neither an express or implicit suggestion to use *Isaksson's* DMT system for the installed copper network in an oil well well-logging apparatus such as taught by *Gardner.*

There is nothing to indicate that person of ordinary skill in the art facing the problem of improving telemetry systems for well-logging, e.g., systems such as *Gardner,* would realize a need for "handling frequency dependent loss and noise". *Gardner's* telemetry systems were not confronted with frequency dependent loss and noise in that *Gardner* transmits in a single-carrier frequency. Thus, it is not logical that a person of ordinary skill in the art would be motivated to combine these references on the notion

that *Isaksson* et al. states DMT modulation handles frequency dependent loss and noise in cables in an efficient manner and also provides high bit rate traffic over the cables because that was not a problem faced in *Gardner.*"

The Examiner agrees that the motivation to combine is the statement of Isaksson that DMT modulation handles frequency dependent loss and noise in cables in an efficient manner and also provides high bit rate traffic over the cables. The motivation has come from the prior art and with the guidance of KSR, looking at the interrelated teachings of the patents, the motivation makes logical sense. Gardener teaches telemetry signal distortion as a function of the cable used to transmit the signals (see column 1, lines 12-32). Isaksson teaches that multicarrier modulation handles frequency dependent loss and noise in cables in an efficient manner (see column 7, lines 5-20). Therefore, it would have been obvious to one skilled in the art at the time the invention was made to apply multicarrier modulation to the cables of Gardener to efficiently handle the loss and noise of cable disclosed by Gardener. Even though Gardener discloses using a "single carrier", there is still noise applied to this carrier frequency through the cable as disclosed by the above teachings of Gardener. Thus, based on the above disclosure, there is sufficient motivation to combine the references.

The Appellant further states (see pages 34-35 of the Appeal Brief) "*Isaksson* discusses that "MUSIC is intended to provide high-speed communication on telephone copper wire pairs for supporting broadband multimedia services." *Isaksson,* Col. 6, lines 20-24. As discussed in the Declarations of Dr. Lloyd Clark and Mr. Michael Montgomery filed in the parent case on December 12, 2005 a person of ordinary skill in the art would

not expect success from applying known DMT techniques to wireline telemetry systems for well-logging. Declaration of Dr. Lloyd Clark, page 3, Declaration of Mr. Montgomery, pages 2-6. One reason for that lack of expectation of success is the length of the cables involved. There is no evidence that there would be a reasonable expectation of success for providing such service on oil field well- logging cables. A typical wireline cable exceeds 30,000 feet. *Isaksson* explicitly states that, "the cable length specification for MUSIC can be successfully limited to 1300 meters. *Isaksson,* Col. 6, lines 33-34. There is nothing in *Isaksson* to suggest its applicability to longer cables. Another difficulty in applying DSL techniques to the wireline environment is the difficult operating conditions.

Initial experimentation by the inventors illustrated the difficulty in taking existing DSL equipment to the wireline cables. These experiments demonstrated that DMT-based ADSL modems could not establish a communications link when used over a 30,000-foot length of well-logging wireline cable. Lloyd Declaration, Page 3.

Thus, there is no reasonable expectation of success in applying the DSL techniques *of Isaksson* to the oil field well-logging telemetry system of *Gardner."*

There is a reasonable expectation of success when applying the multicarrier modulation over cables of Isaksson to a cable telemetry system as disclosed by Gardener. It is the understanding of the Examiner that this application would provide known multicarrier modulation over cables as already taught by Isaksson. Although Isaksson does not disclose cables over 30, 000 ft for multicarrier modulation, it is known that multicarrier modulation can be implemented into wireless technology which can span an area much greater that any man-made cable. Thus, the length of propagation for multicarrier modulation does not prevent a

reasonable expectation of success when combining Gardener and Isaksson. Thus, simply because the cables used in well-logging are longer than the cables used in telephony, does not provide a reason as to why one of ordinary skill in the art would not render implementing DMT modulation into a well-logging (cable) system as obvious.

Bremer

Regarding Bremer, the Appellant states (see pages 35-36 of the Appeal Brief) **"The rejection of Claims 8, 13, 20, and 30 further requires the combination of the *Gardner* and** Isaksson **references with *Bremer*. As noted above, application of DMT modulation to the well-logging wireline telemetry systems required a great deal of engineering effort. (See, Declaration of Dr. Lloyd Clark). One aspect of that engineering effort was the recognition that it would be beneficial to "overall power setting logic to measure the received signal amplitude and, in response to the measure of the received signal amplitude, to transmit the adjustment signal to the downhole telemetry cartridge; and logic to cause the overall power setting logic to be executed prior to determining bits- per-carrier and power-level per carrier" (Claim 8) and "the receiver further comprises logic operable to cause the transmission from the receiver to cable driver of a control signal indicative to the transmission power level control circuitry to increase or decrease the total transmission power applied to the wireline cable" (Claim 13). This is not a standard DSL or DMT technique.**

Therefore, the Examiner relied on *Bremer* to provide these elements. However, even in doing so, the Examiner has not set forth that *Bremer* teaches these elements from

Claim 8 but rather states that, "*Bremer* et al. further discloses optimizing a transmission power applied to a cable (DSL) by measuring the SNR." (Office Action, Page 5, 11. 20-21). Measuring SNR and using it to adjust transmission power is part of other claims. However, Claims 8 recites "overall power setting logic to measure the received signal amplitude and, in response to the measure of the received signal amplitude, to transmit the adjustment signal to the downhole telemetry cartridge." This element is neither taught nor suggested by *Bremer.*

Bremer in fact does disclose these elements. Bremer discloses optimizing a transmission power applied to a cable (DSL) by measuring the SNR (column 5, lines 38-41) of a signal (wherein SNR is a measurement of signal amplitude/noise amplitude) transmitted through the transmission cable and comparing this measured SNR of the transmitted signal to a minimum SNR (see column 6, lines 1-15). The comparison is then used to generate a power control signal (see column 6, lines 1-15) as function of cable noise which can be caused by the length/geometry of the cable (see column 2, lines 35-38) and cable (copper) material (see column 1, lines 49-51), wherein the power control signal is transmitted to the transmitter (such as a downhole telemetry cartridge as disclosed by Gardener) and used to adjust the signal power level (by use of amplifier or driver or equivalent power control means) of the transmitted signal before it is transmitted though the transmission cables (column 6, lines 1-15). The power control can be used in a DMT system absent any bits-per-carrier of power-level-per carrier adjustment (see column 10, lines 1-10). Therefore, based on the above disclosure, Bremer teaches the above elements of the claims.

The Appellant further states that the Examiner has failed to provide logical motivation to combine Gardener, Isaksson, and Bremer. However, as shown above, the Examiner has

provided logical motivation to combine Gardener and Isaksson. Bremer discloses allowing the adjustment of transmission power level can avoid unnecessary power consumption (see column 4, line 65-column 5, line 6). This motivation has come from the prior art and with the guidance of KSR, looking at the interrelated teachings of the patents, the motivation makes logical sense. Thus, since both Isaksson and Gardner use power to transmit signals, this is logical motivation to combine Gardener, Isaksson, and Bremer.

Combination of Cioffi and Gardener

Again, with the guidance of *KSR*, the Examiner has used the rationale that a known technique is being applied to a known device to support the legal conclusion of obviousness with regards to the obviousness rejection of the claims under appeal. Gardener discloses a known well-logging telemetry system which uses cables as a propagation medium (see column 1, lines 13-27). Cioffi discloses known multicarrier modulation (DMT), wherein DMT modulation allows for high spectral efficiencies and can adaptively avoid various signal distortion and noise problems (see column 1, lines 21-25). It is the understanding of the Examiner that applying the known multicarrier properties of Cioffi to the cable telemetry system of Gardener would yield predictable results, such as the known principle of multicarrier transmission over cables. Therefore, the present invention as claimed simply takes a well known form of multicarrier modulation (DMT) and simply uses the modulation in a known transmission/reception system in a well-logging environment which uses cables as a propagation medium between the transmitter and receiver. This application yields predictable results. Cioffi states DMT modulation allows

for high spectral efficiencies and can adaptively avoid various signal distortion and noise problems (see column 1, lines 21-25). This motivation has come from the prior art and with the guidance of KSR, looking at the interrelated teachings of the patents, the motivation makes logical sense. Gardener teaches telemetry signal distortion as a function of the cable used to transmit the signals (see column 1, lines 12-32). Thus, applying the DMT modulation to the distorted cables of Gardener would help avoid signal distortion and noise in the cable, and allow for high spectral efficiency as taught by Cioffi. Thus, based on the above disclosure, there is sufficient motivation to combine the references. It is also the understanding of the Examiner that there is a reasonable expectation of success when applying the multicarrier modulation over cables of Cioffi (see Abstract) to a cable telemetry system as disclosed by Gardener. It is the understanding of the Examiner that this application simply provides known multicarrier modulation (DMT) over cables as already taught by Cioffi.

Combinations of Baird, Gardner, Cioffi, and Isaksson

The Examiner provides the same rationale (application of a known technique to a known device) for the combinations of Baird, Gardener, Cioffi, and Isaksson as stated above. Therefore, according to the above disclosure, there is teaching, suggestion, and motivation to combine the above references.

Combinations of Matsumoto, Bae, and Van Kerchove

The Examiner provides the same rationale (application of a known technique to a known device) for the combinations of Matsumoto, Bae, and Van Kerchove as stated above. Therefore, according to the above disclosure, there is teaching, suggestion, and motivation to combine the above references. Matsumoto, Bae, and Van Kerchove all disclose transmission principles over cables and applying these transmission principles to a cable telemetry system promotes a reasonable expectation of success. The motivation provided Matsumoto, Bae, and Van Kerchove all disclose advantages of DMT (multicarrier) modulation over cables, and therefore, it would have been obvious to one skilled in the art at the time the invention was made to apply these principles of multicarrier modulation to the cables of Gardener.

Conclusion

With the guidance of *KSR*, the Examiner has used the rationale that a known technique is being applied to a known device to support the legal conclusion of obviousness with regards to the obviousness rejection of the claims under appeal. In this instance, the known technique is multicarrier modulation, wherein the known device is a well-logging telemetry device. The present invention as claimed simply takes a well known form of multicarrier modulation (DMT) and simply uses the modulation in a known transmission/reception system in a well-logging environment which uses cables as a propagation medium between the transmitter and receiver. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made that since it is well known that DMT modulation can be used in the presence of cables as shown by the cited references Matsumoto and Bae, that the claimed invention simply applies

the known technique of multicarrier modulation to a known well-logging communication device to provide predictable results such as the transmission and reception of data using a plurality of carriers/frequencies in the well-logging communication system.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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